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HYBOPSIS LINEAPUNCTATA, A NEW CYPRINID FISH FROM THE UPPER ALABAMA RIVER SYSTEM[1]

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ABSTRACT

A new cyprinid, *Hybopsis* ***lineapunctata***, is described from above the Fall Line in the Coosa and Tallapoosa rivers, Mobile drainage. The coarse scales, usually 20–22 around the body, and the dark lateral band are diagnostic characters. *H. lineapunctata* is compared with *Hybopsis amblops* from the Tennessee River, the most closely related form.

Along the inner edge of the Coastal Plain of southeastern United States, the Fall Line marks a distinctive break in geology and biotic distributions. At the Fall Line fast riffles and waterfalls are often effective barriers to fishes, many of which are isolated above the falls, while others are restricted to lowland streams below. Within the headwaters of the Alabama River several endemic fishes have been described, and other forms remain undescribed. One of these, a relative of *Hybopsis amblops* (Rafinesque), has been recognized only recently by Williams (1965: 20), Tucker (1967: 85), and Smith-Vaniz (1968: 40), and is widespread throughout the Coosa and Tallapoosa rivers above the Fall Line.

Numerous other workers have collected this chub (see synonymy), but it has been confused with several related species which inhabit adjacent and nearby streams. A history of the nomenclatural confusion of this group and variation of the related forms are discussed by Clemmer (1971).

Counts and measurements were made according to the methods of Hubbs and Lagler (1958: 19–26) with the following exceptions: the circumferential scale count over the back was taken anterior to the dorsal fin and excluded the lateral line scales. The circumferential scales around the belly were counted immediately anterior to the pelvic insertions and excluded the lateral line scales. The count of predorsal scale rows included rows of scales crossing the midline of the body before the dorsal fin. Vertebral counts taken from x-rays included the Weberian apparatus as four vertebrae.

The postdorsal length extended from the insertion of the dorsal fin to the caudal base. Posterior maxillary length was measured on the right side from the corner of the mouth posterior to the end of the upper jaw. In many individuals the mouth had to be opened with a forceps to obtain this measurement. Most measurements were made on adult specimens of 40 mm standard length or larger; however, gravid females were excluded.

[1] Contribution No. 3 from Laboratory of Systematics and Environmental Biology, Environmental Science Center, Tulane University.

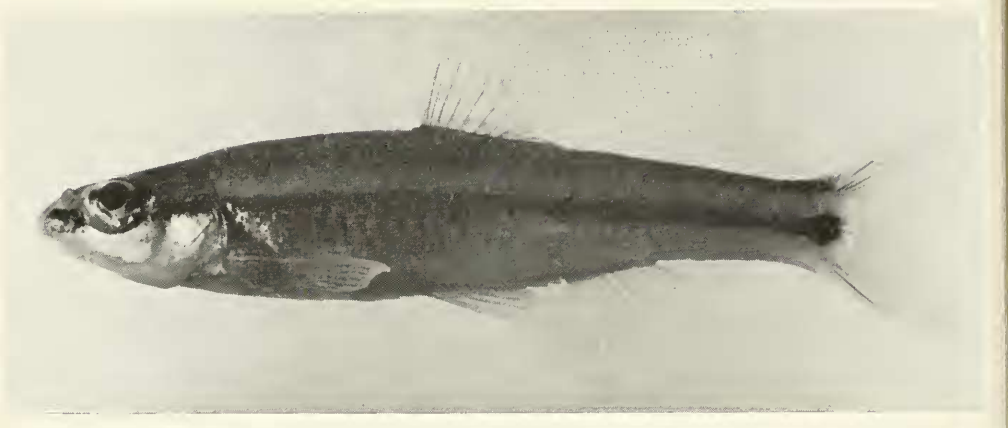

Figure 1. *Hybopsis lineapunctata*, lateral view of a paratype (TU 41118) tuberculate male, 54.5 mm SL, Tallapoosa drainage, Elmore Co., Alabama, 12 April 1966.

Hybopsis **lineapunctata** sp. nov.
Lined chub
(Figs. 1–3)

Nocomis amblops var. *winchelli* (Girard). Jordan, 1877: 328–330 (key, Coosa R.).

Nocomis winchelli (Girard). Jordan, 1877: 330 (Coosa R.).

Nocomis amblops winchelli (Girard). Jordan, 1877: 369 (Etowah R.).

Ceratichthys winchelli (Girard). Jordan and Brayton, 1878: 53 (Coosa R.).

Hybopsis amblops rubrifrons Jordan. Gilbert, 1891: 155 (Coosa R.).

Hybopsis amblops (Rafinesque). Fowler, 1924: 410 (Etowah R.). Boschung, 1961: 270 (Coosa R.).

Erimemus hyalinus (Cope). Fowler, 1945: 341 (Coosa R.).

Hybopsis sp. Williams, 1964: 20 (Tallapoosa R.). Tucker, 1967: 85 (Coosa, Tallapoosa Rivers).

Holotype.—TU 53405, a nuptial male, 61 mm standard length, Tallapoosa River drainage, Clay County, Alabama, Enitachope Creek, tributary to Hillabee Creek, 2.9 miles SW of Ashland, Hwy. 9, RDS 3877, GHC 420, 13 April 1966, R. D. Suttkus and Glenn H. Clemmer.

Collected with the holotype were 46 paratopotypes (TU 40643). Paratypes, all from the Tallapoosa River, and other material examined are listed in a subsequent section. Comparative material of *H. amblops* is listed in Clemmer (1971).

Diagnosis.—A large-sized species of the *Hybopsis amblops* group (maximum length examined, 66 mm in SL) with coarse scales; circumferential scales usually 20–22, sometimes 24 in the Coosa River population. Dark lateral band well developed, narrowing over the caudal peduncle, widening before confluence with a large, darkly pigmented caudal spot. Lateral band accentuated by distinct light band above without melanophores; dorsal scales darkly outlined along their posterior margin.

Description.—Counts and proportional measurements are given in Tables 1–6. *Hybopsis lineapunctata* has a subterete, somewhat compressed body form. The predorsal profile is convex; the postdorsal profile is nearly straight. The head is long, averaging about 27% of standard length. The snout is long and overhangs the inferior, slightly oblique mouth. The lower jaw is included; the single pair of maxillary barbels is well developed. There are eight dorsal fin rays and 12 scales around the caudal peduncle.

The pharyngeal tooth count is 1,4–4,1; the teeth in the main row are compressed and moderately hooked, with tooth IV rounded and nearly straight. The eye is slightly superior (about 28.5% of the head length); the diameter is usually less than the length of the snout.

The lateral line is complete and slightly decurved anteriorly. The anterior scales of the lateral line series are elevated; the exposed portion about twice as high as wide;

TABLE 1. Proportional Measurements of *Hybopsis lineapunctata* and *H. amblops* Expressed in Thousands of Standard Length. (Mean Value in Parentheses).

	lineapunctata		*amblops*
Drainage	Tallapoosa	Coosa	Tennessee
Number of Specimens	50	23	63
S L in mm	42.1–61.7	43.3–54.2	38.0–71.5
Body depth	186–231 (211)	175–224 (197)	185–229 (209)
Body width	111–168 (139)	111–149 (126)	108–161 (134)
Head length	259–283 (260)	261–289 (271)	256–287 (272)
Head depth	145–169 (156)	143–162 (151)	152–171 (161)
Head width	136–160 (147)	130–149 (140)	126–157 (143)
Snout length	68–94 (82)	79–92 (85)	69–93 (82)
Eye length	65–90 (76)	73–87 (80)	74–93 (83)
Interorbital width, bony	49–62 (55)	53–66 (58)	42–56 (50)
Prepectoral length	249–306 (272)	258–287 (275)	247–291 (272)
Prepelvic length	466–526 (499)	476–523 (501)	480–530 (507)
Predorsal length	491–541 (514)	503–535 (518)	506–549 (526)
Preanal length	650–724 (687)	674–722 (695)	668–726 (693)
Caudal peduncle length	203–253 (225)	203–252 (224)	192–237 (216)
Caudal peduncle depth	91–102 (96)	80–100 (94)	82–105 (95)
Dorsal fin base	97–131 (110)	100–118 (111)	107–133 (120)
Dorsal fin length	208–249 (227)	215–252 (230)	212–270 (238)
Anal fin base	78–109 (91)	76–105 (91)	88–118 (102)
Anal fin length	170–228 (188)	167–211 (191)	174–222 (192)
Pectoral fin length	181–230 (211)	191–230 (211)	181–248 (211)
Postdorsal length	482–532 (510)	484–526 (513)	487–528 (511)
Gape width	51–81 (63)	51–67 (60)	56–84 (67)
Posterior maxillary length	26–37 (31)	27–34 (31)	26–36 (31)

the posterior margins are slightly indented. The posterior ⅔ of the breast is scaled.

The dorsal fin originates directly above or just behind the origin of the pelvic fins and is inserted almost equidistant from the snout and caudal base. The dorsal and anal fins are slightly falcate.

Coloration.—In preservation the diagnostic dark lateral band originates anteriorly on the body with a prominent scapular bar. The dorsal edge of the band is even along the entire length; the lower edge is diffuse anteriorly and becomes even-edged about midway along the body. The lateral band underlies a single scale row anteriorly, broadens slightly before the dorsal fin, and narrows to approximately one half the scale depth at the caudal peduncle. The band then widens slightly and is confluent with a large caudal spot. The spot is round to truncate and is slightly larger than the overlying scale. The melanophores generally extend to the

Table 2. Comparison of Fin Ray Counts in Two Species of *Hybopsis*.

Species and Drainage	Caudal Fin Rays 18	19	20	N	$\bar{x}$
H. amblops					
Tennessee River		97	3	100	19.03
H. lineapunctata					
Coosa River	1	59	1	61	19.00
Tallapoosa River	2	81	1	84	18.99

Species and Drainage	Anal Fin Rays 7	8	9	N	$\bar{x}$
H. amblops					
Tennessee River	3	135	3	141	8.00
H. lineapunctata					
Coosa River	5	65	2	72	7.97
Tallapoosa River	26	104	1	129	7.84

base of the caudal rays. Except for a few scattered melanophores, the scales in the lateral line series are transparent. In the diffuse region of the lateral band large melanophores line the scale pockets forming dusky vertical bars that are broken by the lateral line canal.

Immediately dorsal to the dark lateral band is a light band that is one half to one scale deep. Above this band and across the dorsal surface of the body the scales are well outlined with a dark row of melanophores along their posterior margin. The underlying skin is pigmented with a gradual reduction in melanophores anterior to the line of insertion of each scale.

There is a slight to moderately developed mid-dorsal line from the occiput to the dorsal fin which sometimes extends slightly posterior to the dorsal fin.

There are no melanophores below the lateral band except for those which form a weak mid-ventral line extending from the anus to the procurrent rays of the caudal fin.

On the head a dark lateral band extends from the lacrimal region through the eye and across the operculum where it joins the band along the body. An unpigmented area lies just dorsal to the band over the operculum and curves dorsally over the posterior portion of the orbit. The dorsum of the head from the snout to the occipital ridge is darkly pig-

Table 3. Comparison of Fin Ray Counts in Two Species of *Hybopsis*.

Species and Drainage	Pelvic Fin Rays 6	7	8	9	N	$\bar{x}$
H. amblops						
Tennessee River		2	128	11	141	8.06
H. lineapunctata						
Coosa River			70	2	72	8.03
Tallapoosa River	1	2	133	4	140	8.00

Species and Drainage	Left Pectoral Fin Rays 13	14	15	16	17	N	$\bar{x}$
H. amblops							
Tennessee River	1	18	66	48	8	141	15.31
H. lineapunctata							
Coosa River	5	40	24	2		71	14.32
Tallapoosa River	4	60	67	8		139	14.57

TABLE 4. Comparison of Scale Counts in Two Species of *Hybopsis*.

Species and Drainage	Lateral Line Scales 34	35	36	37	38	N	$\bar{x}$
H. amblops							
Tennessee River		19	75	39	5	138	36.22
H. lineapunctata							
Coosa River	1	17	33	16	5	72	36.10
Tallapoosa River	16	68	45	3		132	35.27

Species and Drainage	Predorsal Scale Rows 11	12	13	14	15	N	$\bar{x}$
H. amblops							
Tennessee River		8	48	72	8	136	13.59
H. lineapunctata							
Coosa River	1	11	54	5		71	12.89
Tallapoosa River	1	38	95	5	1	140	12.76

mented with a heavy concentration of melanophores over the orbit and forming a heart-shaped parietal patch.

A few small melanophores are scattered across the snout and encircle the rim of the orbit. The lips and region ventral to the lateral band are unpigmented.

The fins are translucent at the base grading to a distal transparency. Fine rows of melanophores generally outline the rays of the fins except on the innermost rays of the pectoral fins and the entire pelvic fins. The peritoneum is silvery with scattered melanophores.

In life the dorsal half of the body is golden;

TABLE 5. Comparison of Scale Counts in Two Species of *Hybopsis*.

Species and Drainage	Circumferential Scales above Lateral Line 9	10	11	12	N	$\bar{x}$
H. amblops						
Tennessee River	1	6	130	2	139	10.96
H. lineapunctata						
Coosa River	29	13	29		71	10.00
Tallapoosa River	94	18	30		142	9.55

Species and Drainage	Circumferential Scales below Lateral Line 8	9	10	11	12	13	N	$\bar{x}$
H. amblops								
Tennessee River			2	127	4	8	141	11.13
H. lineapunctata								
Coosa River		18	19	32			69	10.20
Tallapoosa River	2	125	11	3			141	9.13

Species and Drainage	Circumferential Body Scales 19	20	21	22	23	24	25	26	27	N	$\bar{x}$
H. amblops											
Tennessee River				1	6	120	6	6	1	140	24.09
H. lineapunctata											
Coosa River		14	13	11	11	22	1			72	22.24
Tallapoosa River	2	87	20	26	3	3				141	20.65

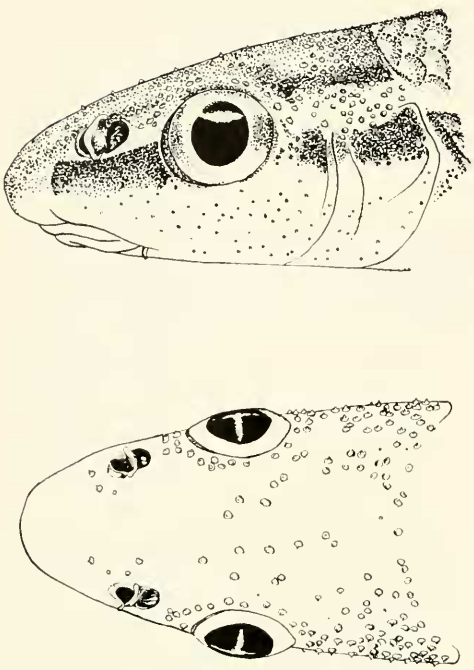

Figure 2. Lateral and dorsal view of head of *Hybopsis lineapunctata* showing characteristic nuptial tuberculation and lateral pigmentation.

the region below the lateral band is silvery white. The iris has a slight orange tint. No breeding colors or sexual dimorphism in pigmentation were noted. The coloration of the juveniles is essentially the same as that in the adults.

Nuptial tubercles are moderately developed on the head and pectoral fins of the male during the breeding season (Fig. 2). Small tubercles are scattered over the dorsal surface of the head extending just anterior to the nostrils. There is a slight concentration of tubercles lining the dorsal rim of the orbit, and a greater concentration covering the area over the operculum dorsal to the pigmented band. Irregular rows of tubercles develop along the margins of the dorsal scales, diminishing in number laterally and toward the dorsal fin. The remainder of the body and head is devoid of tuberculation; however, there are prominent sensory pits and papillae over the lateral and ventral surfaces of the head. These latter structures are also evident on the head of the breeding female.

The first seven or eight pectoral rays of the male are lined with tubercles on the dorsal surface. The first ray has a single row at the base, a double row of tubercles often irregularly arranged medially, with a reduction to a single row along the outer margin of the ray. The second to seventh or eighth rays have a single row of tubercles proximally, two to three rows in patches of six to twelve tubercles per ray joint centrally, diminishing to a single row along the distal portion of these rays.

Reproduction.—Tuberculate males with enlarged testes and females with mature ova were collected from mid-March to early June. Ripe males and females were taken on 12–13 April 1966, in four tributaries of the Tallapoosa River. Stream widths varied from 2 to 45 ft.; the water was clear to moderately turbid. All collections were made during the day with water temperatures varying from 17–21°C; air temperatures were 21–26°C. *H. lineapunctata* was taken over sand and sand-silt bottoms from the deeper pools in the smaller streams and usually from along the banks in slow to quiet water in the larger tributaries having a moderate current. Most of the specimens collected were breeding adults with individuals as small as 34 mm having enlarged gonads. Post-spawning adults were collected as early as 23 May. The males had lost their nuptial tuberculation, and both sexes were emaciated.

Range.—*H. lineapunctata* is endemic to the Tallapoosa and Coosa rivers above the

Table 6. Frequency Distribution of Vertebrae in Two Species of *Hybopsis*.

Species and Drainage	36	37	38	N	$\bar{x}$
H. amblops					
Tennessee River	19	23	2	44	36.61
H. lineapunctata					
Coosa River	16	12	1	29	36.48
Tallapoosa River	21	16	1	38	36.47

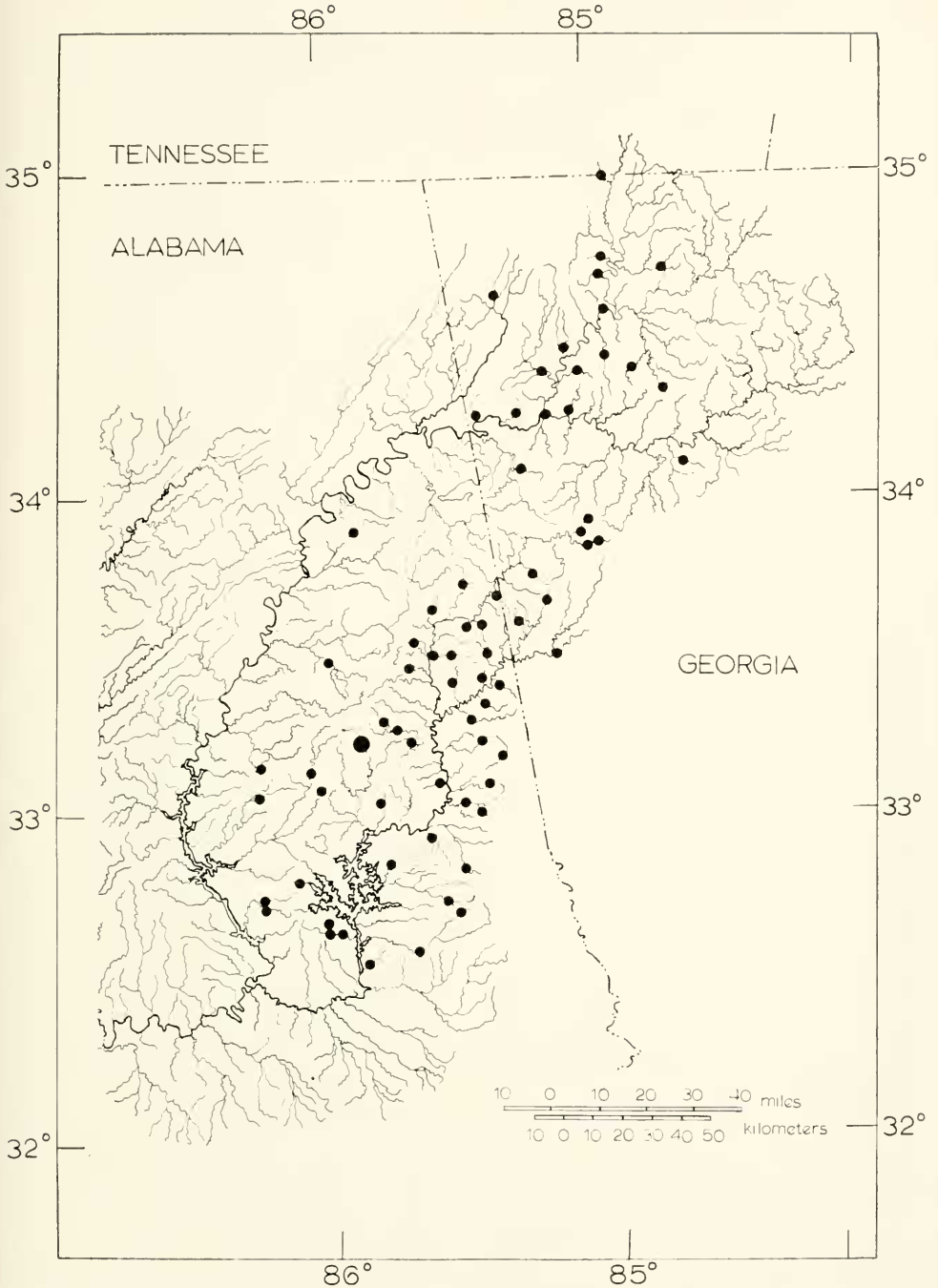

Figure 3. Distribution of collection sites of *Hybopsis lineapunctata* in the upper Alabama River system. Large circle indicates type-locality.

Fall Line in Alabama and Georgia and has been collected in Mill Creek in Tennessee. It is commonly found in small to moderate-sized streams in slightly flowing to quiet water, usually near riffle areas. In recent collections from streams affected by impoundments, *H. lineapunctata* has been absent to rare. It has not been reported from the Tallapoosa and Coosa rivers proper, although the main channels have not been well surveyed. The two specimens reported by Williams (1965) and Tucker (1967) from Uphapee Creek, a tributary of the Tallapoosa River, below the Fall Line were misidentified (Williams, personal communication).

Variation.—The scale size of *H. lineapunctata* is relatively variable as shown in the circumferential body scale counts (Table 5). The Tallapoosa River population usually has coarser scales around the body (19 to 24, usually 20 to 22, $\bar{x}$: 20.65) than does the Coosa River population with scale counts of 20 to 25 (usually 24 or less, $\bar{x}$: 22.24). Most of the higher counts were from specimens collected in the headwaters of the Coosa system in Georgia. This may be attributed to the higher altitude and corresponding environmental factors which may have affected scale size during embryological development. There was no clinal trend in this count on specimens from the Tallapoosa River.

The pharyngeal tooth count for 44 specimens was 1,4–4,1; one had 0,4–4,1, two had 1,4–4,0, and one had 2,4–4,2.

Several specimens lacked barbels. Other counts, coloration, and morphometric characters were relatively uniform.

Relationships.—*Hybopsis lineapunctata* is apparently most closely related to *H. amblops*. The two species are similar in size, general body form, tubercle arrangement, and most meristic and morphometric data. *H. lineapunctata* and *H. rubrifrons* are also morphologically similar. These three forms are considered as a close species group distinct from other *Hybopsis* species from neighboring streams. The red breeding color of *H. rubrifrons* is unique for this group and is considered to be a specialized character. *H. rubrifrons* is probably an isolated derivative, and did not give rise to *H. lineapunctata*. The coarse scales and distinctive lateral pigmentation of *H. lineapunctata* are also unique characters for this group and suggest a modified condition following isolation. These characters along with the isolated distribution suggest that *H. lineapunctata* is a derivative of a *H. amblops* stock.

H. lineapunctata presumably originated from *H. amblops* stock of the Tennessee River which gained access to the Coosa River through stream capture. Campbell (1896) and Hayes (1899) gave geological evidence for stream changes in this area. Ramsey (1966) and Smith-Vaniz (1968) also provided evidence of faunal exchange between these drainages in their comparisons of the ichthyofauna of this region. Following a period of isolation and differentiation within the Coosa River, *H. lineapunctata* later spread into the Tallapoosa River. This dispersal also was probably through stream piracy as the mouths of both rivers lie below the Fall Line. *H. lineapunctata* now occurs above the Fall Line, isolated from other members of the *H. amblops* complex.

Etymology.—The name *lineapunctata* refers to the diagnostic pigmentation of the lateral band and the prominent caudal spot.

Materials.—Other paratypes all from the Tallapoosa system. Georgia—Carroll Co.: UAIC 1310 (2) Turkey Cr., 1 mi NW Mt. Zion Community, 4 July 1964; UAIC 1316 (3) Indian Cr. 3.5 mi ENE Tyus, 5 July 1964; UAIC 1317 (6) Mountain Cr. Hwy 5, 3 mi W Tyus, 5 July 1964; UAIC 1318 (6) Small Creek 5 mi, N Bowden, 5 July 1964; Haralson Co.: UAIC 1251 (2) Wircher Cr. 3.5 mi N Hwy 120, 2.5 mi W jct. 120 and 101, 18 April 1964; UAIC 1308 (1) Walker Cr. Hwy 100, 1.7 mi S Tallapoosa city limits, 4 July 1964; UAIC 1309 (1) Walker Cr. 3.2 mi SW Waco near Carroll Co. line, 4 July 1964.

Alabama—Chambers Co.: UAIC 1375 County Line Cr., 0.7 mi W Ridge Grove or Sikes, 14 August 1964; UAIC 1376 Carlisle Cr. 0.5 mi S Albany, 9 mi N Lafayette, 14 August 1964; UAIC 1377 (6) Caty Cr. 0.7 mi N Johnson's Crossroads, 0.3 mi S Chambers Road, 14 August 1964; UMMZ 168670 (3) Chikasanoxee Cr. at Milltown, 3 September 1954. Clay Co.: UAIC 1036 (10) Crooked Cr., Hwy 48, 2.3 mi S Lineville, 12 September 1963; UAIC 1039 (15) Enitachope Cr., Hwy 9, 2.9 mi SW Ashland, 12 September 1963; UAIC 1509 (2) Trib. to Ketchepedrakee Cr., Hwy 9, 3 mi NNE Delta, 5 November 1964; UAIC 1517 (9) White Oak Cr., 1 mi S Cragford School, 11 November 1964; UMMZ 168767 (1) Hatchet Cr., Hwy 7, 8.3 mi N Good-

water; UMMZ 175795 (2) Hatchet Cr., Hwy 7, 8.3 mi N Goodwater, 13 September 1958; UMMZ 177751 (19) Crooked Cr., 1.5 mi SW Lineville, 23 May 1956; TU 29884 (1) Enitachope Cr., Hwy 9, 2.9 mi SW Ashland, 21 September 1963; TU 32729 (8) Enitachope Cr., Hwy 9, 2.9 mi SW Ashland, 1 June 1964. Cleburne Co.: UAIC 1064 (1) Cahulga Cr., Hwy 78, 0.2 mi W Heflin, 3 November 1963; UAIC 1066 (26) unnamed trib., Hwy 46, 1.7 mi NW Tallapoosa R., 3 November 1963; UAIC 1067 (2) Vero Cr., Hwy 46, 3.2 mi E Tallapoosa R., 3 November 1963; UAIC 1068 (41) Knakes Cr., 2 mi SW Hwy 46 at Hightower, 3 November 1963; UAIC 1069 (2) Lockchelooge Cr., Hwy 431, 0.5 mi E Tallapoosa R., 3 November 1963; UAIC 1098 (13) unnamed trib. to Cane Cr., Hwy 78, 0.2 mi E Edwardsville, 7 December 1963; UAIC 1319 (3) Kelly Cr., 0.5 mi N Lebanon, 5 July 1964; UAIC 1320 (3) Silas Cr., 4 mi S Hopewell, 5 July 1964; UAIC 1504 (3) Lockchelooge Cr., 0.5 mi N Micaville, 5 November 1964; UAIC 1505 (2) unnamed trib. near Randolph Co. line, 7 mi E Micaville, 5 November 1964. Elmore Co.: UAIC 1284 (5) Channahatchee Cr., 2 mi N Kent; UAIC 1362 (4) Channahatchee Cr., 1 mi E Eclectic, 9 August 1964; TU 12085 (8) Gold Branch Hwy 63, 6 mi NE Eclectic, 5 October 1955; TU 15281 (156) Gold Branch, Hwy 63, 6 mi NE Eclectic, 16 March 1957; TU 41118 (28) Gold Branch, Hwy 63, 12 April 1966; TU 41132 (1) Channahatchee Cr., Hwy 229, 2.5 mi S Red Hill, 12 April 1966. Lee Co.: UAIC 1529 (5) unnamed trib. to Sougahatchee Cr., Hwy 11, 0.6 mi SE Macon Hill, 14 November 1964; UAIC 1911 (2) Little Loblockee Cr., Hwy 147, 0.5 mi S Gold Hill. Paulding Co.: UAIC 1247 (3) McClennan Cr., Hwy 101, 1.5 mi N jct. Hwy 120, 18 April 1964; UAIC 1248 (4) unnamed trib. to Wircher Cr., 3 mi N jct. Hwy 100 and 101, 18 April 1964; UAIC 1249 (2) Wircher Cr., 2 mi SW Yorksville, 18 April 1964; UAIC 1250 McClennan Cr., 0.8 mi N off Hwy 120, 2.5 mi W jct 101. Randolph Co.: UAIC 1378 (25) Jones Cr., Hwy 431, 1 mi N Roanoke, 14 August 1964; UAIC 1379 (3) Cornhouse Cr., Hwy 431, 7.0 mi NW Roanoke, 14 August 1964; UAIC 1380 (1) Wedowee Co., Hwy 48, 0.5 mi E Wedowee, 14 August 1964; UAIC 1381 (5) Bear Co., Hwy 48, NE Wedowee, 14 August 1964; UAIC 1382 (7) Cutnose Cr., Hwy 48, NE Wedowee, 14 August 1964; UAIC 1383 (2) Cohobodiah Cr., Hwy 82 at Newall, 14 August 1964; UAIC 1497 (17) Pineywoods Cr., Hwy 341, 11 mi N Wedowee, 31 October 1964; UAIC 1519 (14) Hurricane Cr. between Almond and Malone, 11 November 1964; UMMZ 168762 (5) Wedowee Cr. at Wedowee, 12 September 1954; TU 40668 (12) Trib. to Little Tallapoosa R., Hwy 82, 2.9 mi W Hwy 431, 13 April 1966. Tallapoosa Co.: UAIC 1282 (20) Stone Cr. at Carrville, 0.1 mi N Hwy 14, 14 June 1964; UAIC 1487 (2) Buck Cr., Hwy 280, just E Dadeville; UAIC 1522 (92) County Line Cr. between Hampton and Buttston, 11 November 1964; UAIC 1523 (1) Timbergut Cr., Hwy 22, W New Site, 11 November 1964; CU 51708 (6) Coon Cr., 6 mi N Tallassee, 10 April 1965.

Other material, all from the Coosa drainage:

Tennessee—Bradley Co.: UT 44.330 (2) Mills Cr., NE Red Clay, Ga., 16 November 1968.

Georgia—Bartow Co.: TU 7391 (10) Trib. to Coosawattee R., Hwy 411, 2 mi N White, 19 April 1953; TU 12078 (1) Trib. to Pine Log Cr., Hwy 140, 0.3 mi W Folsom, 9 October 1955. Cherokee Co.: ANSP 75647 (1) N Spring Cr., 6 July 1942; ANSP 75648 (2) Chesterfield Cr., 4 mi S Menla, 10 July 1942; ANSP 75649 (2) Terrapin Cr., 6 July 1942. Cobb Co.: CU 20964 (1) Trib. to Allatoona Cr., Hwy 41, 0.4 mi SE Acworth, 12 June 1952. Floyd Co.: CU 17420 (3) Trib. to Oostanoula R., Hwy 53, 11.7 mi NE Rome, 31 March 1950; UMMZ 88206 (2) Trib. to Coosa R., 5 mi W Coosa, 1 September 1929; UMMZ 88228 (4) Trib. to Coosa R., E Coosa; UMMZ 88252 (8) Armuchee Cr. at Armuchee; UMMZ 157919 (2) Trib., Hwy 411, 5 mi ESE Rome. Gordon Co.: UMMZ 139118 (12) Oostanoula R. at mouth of Spring Branch, 1 mi NE Hwy 41 between Resaca and Calhoun; TU 35039 (1) Trib. to John Cr., Hwy 156, 10.5 mi W Calhoun, 24 June 1964. Murray Co.: CU 24913 (2) Trib. to Coosawattee R., Hwy 411, 5.1 mi S Chatsworth, 4 September 1953; CU 28277 (2) Trib. to Holly Cr., Hwy 411, 3.2 mi S Chatsworth, 4 September 1953; TU 37558 (1) Rock Cr., Hwy 411, 6 mi S Chatsworth, 26 April 1965; USNM 168045 (1) Trib. Hwy 411, 5.2 mi S Chatsworth, 10 September 1954. Polk Co.: UMMZ 88200 (2) Lake Cr., 5 mi NW

Cedartown, Walker Co.: TU 27570 (1) Trib. to Chattooga R., 2.5 mi E of point 8.3 mi S Lafayette, 30 May 1962; TU 40672 (1) Duck Cr., Hwy 337, 1.3 mi NE Centerpost, 14 April 1966; TU 40697 (7) Duck Cr., 0.2 mi E Bronco, 6.8 mi SW Lafayette, 14 April 1966. Whitfield Co.: CU 21207 (4) Trib. to Conasauga R., Hwy 41, 1 mi S Dalton, 13 June 1952; CU 42557 (1) Swamp Cr., Hwy 41, 6.1 mi S Dalton, 20 April 1962; UMMZ 139097 (1) Trib. to Conasauga R., Hwy 41, 7.3 mi S Dalton.

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